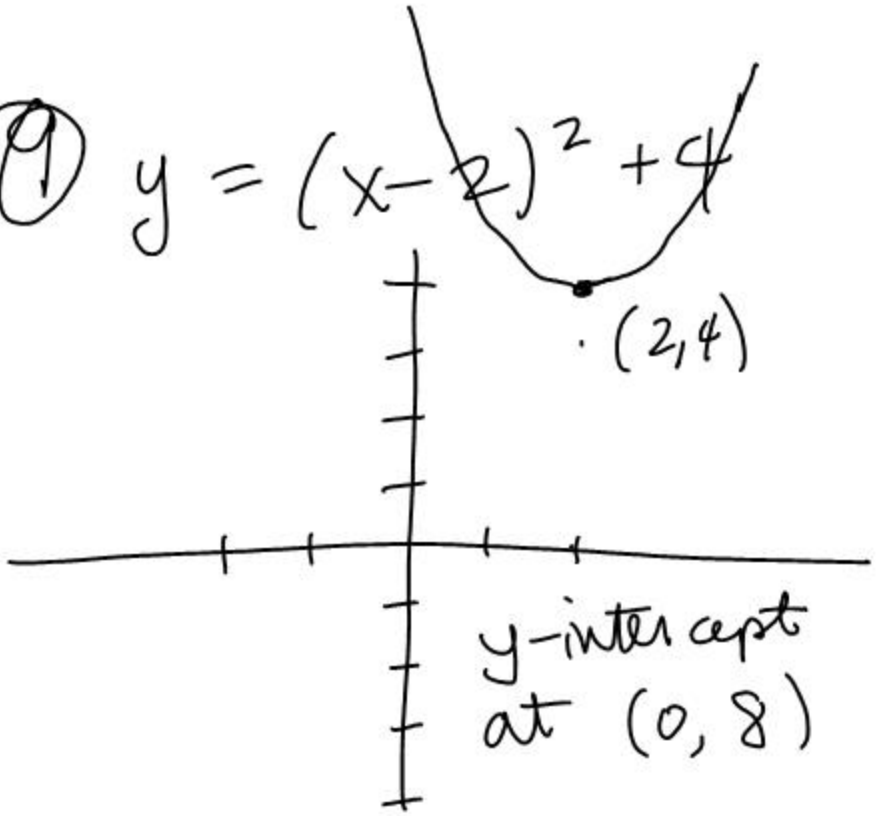
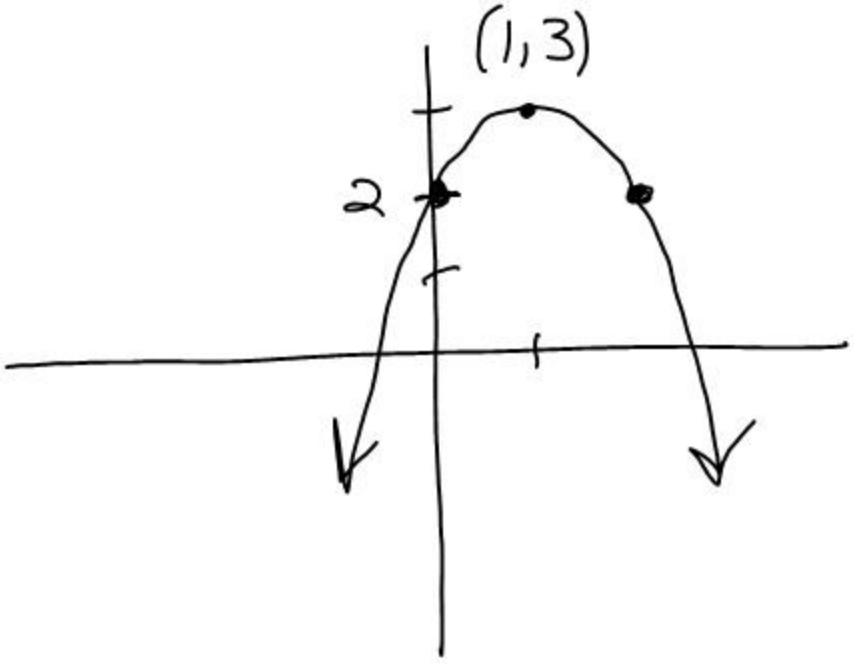
(9) $y = (x-2)^2 + 4$




(10) $y = \underline{3} - (x \underline{-1})^2$

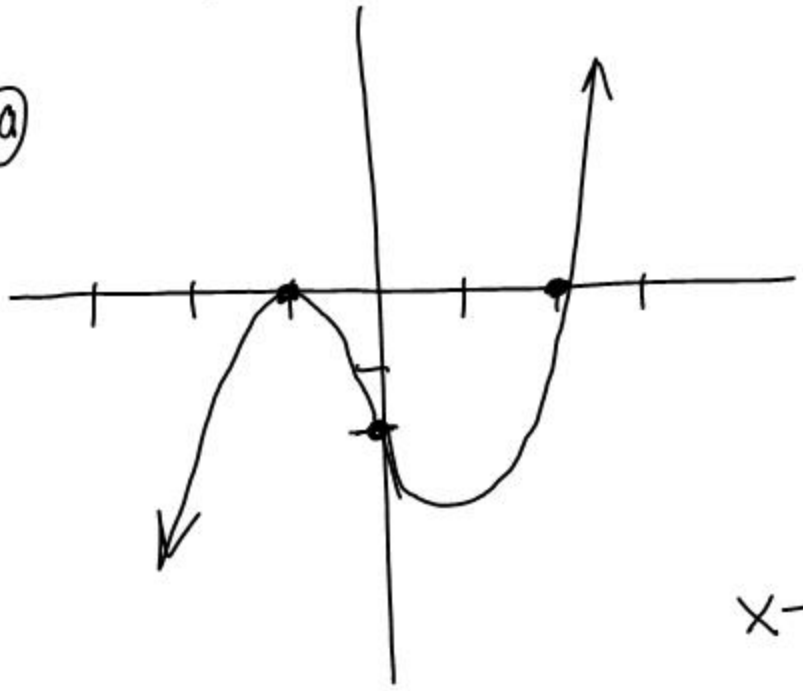


(11) Sketch (roughly)

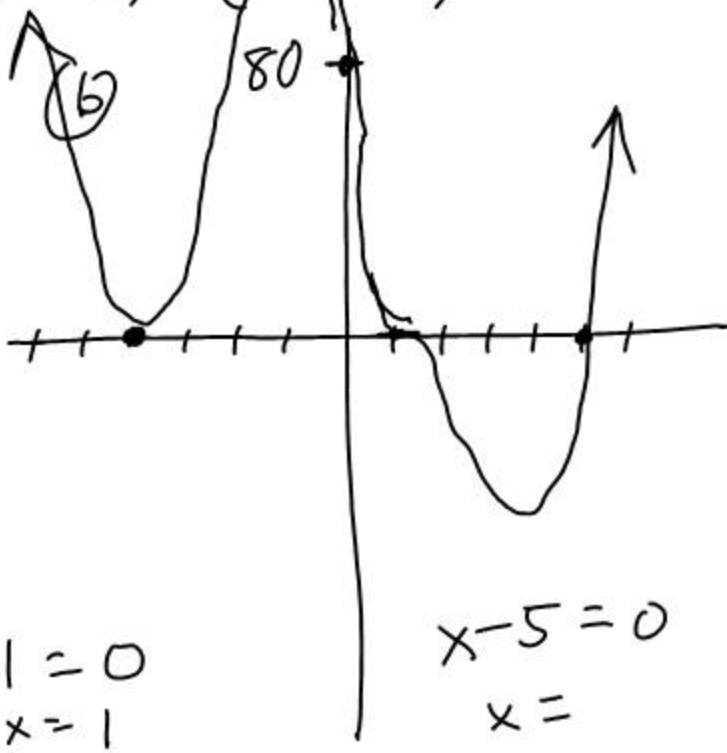
(a) $f(x) = (x-2)(x+1)^2$

(b) $g(x) = (x-1)^3(x+4)^2(x-5)$

(a)



(b)




$x-1=0$

$x=1$

$x-5=0$

$x=$

$(0-1)^3(0+4)^2(0-5)$

$(-1)(16)(-5) = 80$

Sketch: $f(x) = x^5 + 5x^4 - 5x^3 - 45x^2 + 108$

2 | 1 | 5 | −5 | −45 | 0 | 108
  |  | 2 | 14 | 18 | −54 | −108
  | 1 | 7 | 9 | −27 | −54 | 0

$(x-2)$

2 | 1 | 7 | 9 | −27 | −54
  |  | 2 | 18 | 54 | 54
  | 1 | 9 | 27 | 27 | 0

$(x-2)^2$

~~2~~ | 1 | 9 | 27 | 27
  |  | 2 | 22 | 98
  | 1 | 11 | ~~4~~9

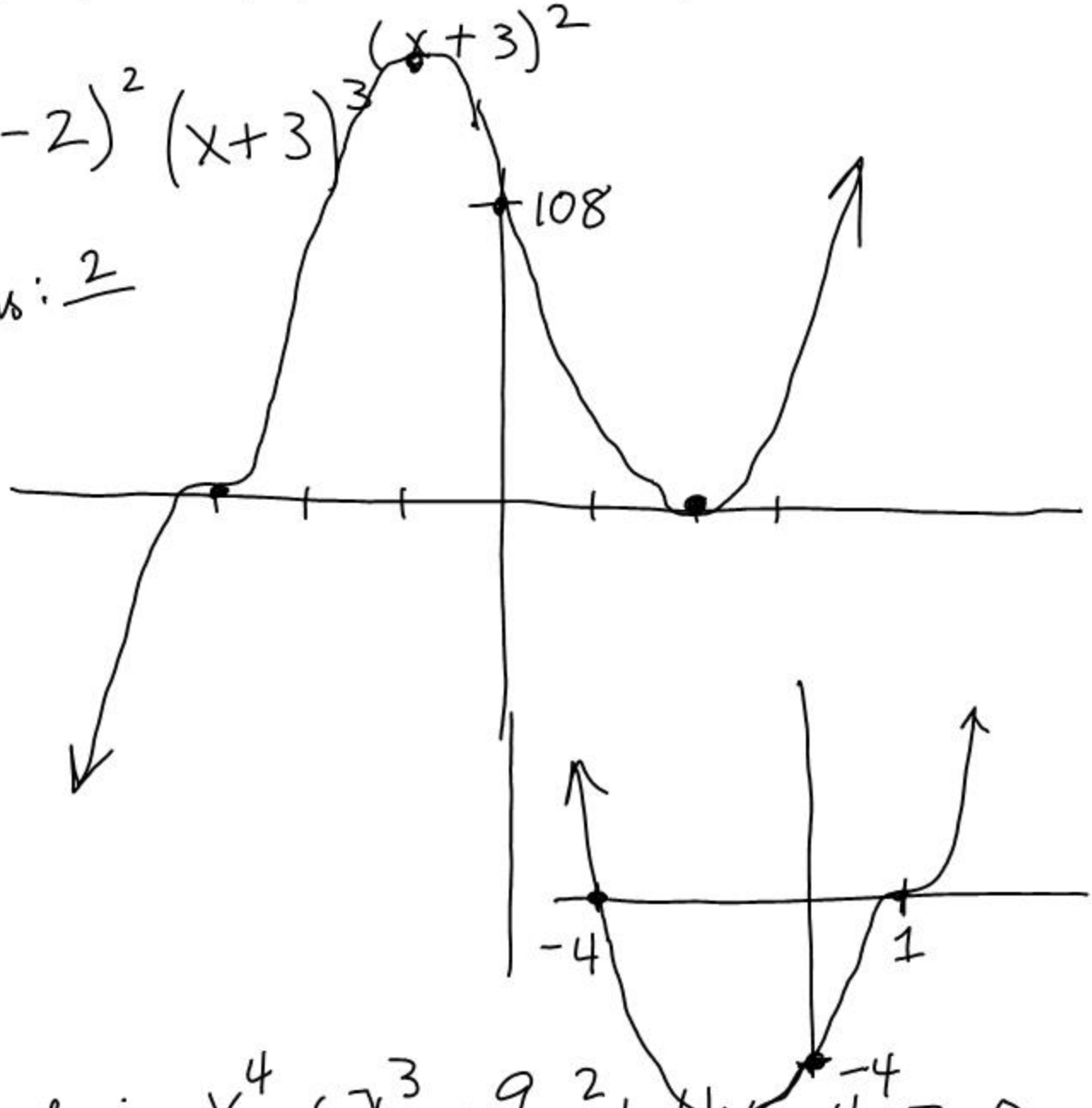
~~-2~~ | 1 | 9 | 27 | 27
  |  | −2 | −14 | −26
  | 1 | 7 | 13

−3 | 1 | 9 | −27 | 27
  |  | −3 | 18 | −27
  | 1 | 6 | 9 | 0

$(x+3)$

$(x-2)^2(x+3)$ ~~$(x^2+6x+9)$~~

$y = (x-2)^2(x+3)^3$




turns: 2




(13) Solve: $x^4 + x^3 - 9x^2 + 11x - 4 = 0$

1] 1 1 −9 11 −4

| | 1 | 2 | −7 | 4 |
|---|---|---|---|---|
| 1 | 2 | −7 | 4 | 0 |

1] 1 2 −7 4

| | 1 | 3 | −4 |
|---|---|---|---|
| 1 | 3 | −4 | 0 |

$(x-1)^2(x^2+3x-4)$

$(x-1)^2(x-1)(x+4)$

Roots: $x = 1, -4$

(14) Solve: $x^3 - x^2 - 3x - 1 = 0$

$-1$ | $1$ $\quad -1 \quad -3 \quad -1$

$\quad\quad -1 \quad\quad 2 \quad\quad 1$

---

$1 \quad -2 \quad -1 \quad \boxed{0}$

$(x+1)(x^2 - 2x - 1) = 0$

$\boxed{x = -1}$ $\qquad x = \dfrac{2 \pm \sqrt{4 - 4(-1)}}{2} = \dfrac{2 \pm \sqrt{8}}{2}$

$= \dfrac{2 \pm 2\sqrt{2}}{2} = \underline{1 \pm \sqrt{2}}$

(15) How many positive and negative roots are possible? (Descartes' Rule)

$x^3 + 3x^2 + 5x + 4 = 0$

no pos. roots

$(-x)^3 + 3(-x)^2 + 5(-x) + 4 = 0$

$-x^3 + 3x^2 - 5x + 4 = 0$

3 or 1 neg. root.